IES

IES WHITE PAPER

INSTITUTE FOR AN
ENTREPRENEURIAL SOCIETY

An Entrepreneurial Fix For Forensic Errors

Private Sector Can Help Reduce False Convictions

By Roger Koppl
Professor of Finance
Whitman School of Management
Syracuse University

Syracuse University
Whitman School
of Management

Institute for an Entrepreneurial Society

Syracuse University
Whitman School
of Management

TABLE OF CONTENTS

1 INTRODUCTION

Movies and television shows portray crime labs' analysis of fingerprints, DNA and other physical evidence as unambiguous—i.e., reliably proving guilt or innocence, whichever one fits the script. Unfortunately, forensic science isn't anywhere close to infallible in the real world. Some errors arise from carelessness and misconduct. Others involve flawed analysis and interpretation, made possible by the inherent subjectivity of forensic procedures. When not refuted, crime lab errors are sometimes serious enough to result in false convictions sending innocent people to prison. The media regularly report exonerations based on faulty forensics. The stories reveal the individual tragedies of those serving time for crimes they didn't commit, but these wrongful verdicts also represent a tragedy for society as a whole because they undermine the credibility and perceived fairness of the criminal justice system.

No one tracks forensic errors or knows how many false convictions occur in any given year—the data simply don't exist. However, even a small sampling of the anecdotal evidence is cause for alarm. In 1999, two men armed with guns abducted a woman from her Houston apartment complex and raped her. The victim later saw two men she believed to be her assailants, and police arrested them. One was released after tests found his body fluids didn't match evidence from the woman's car. The other suspect was 16-year-old Josiah Sutton, and he wasn't so lucky. A Houston Crime Lab forensic expert testified that Sutton's DNA was a unique match for semen found on the victim's clothes. Based largely on DNA evidence, a court found him guilty and sentenced him to 25 years in prison. In 2013, another DNA expert challenged the original findings, arguing that the DNA didn't eliminate other potential suspects. New tests proved that Sutton couldn't have been the source of the DNA recovered from the victim and crime scene. He was freed after serving more than four years in prison.

Flawed forensic work at two labs in Massachusetts tainted nearly 50,000 convictions. Annie Dookhan worked for more than eight years at Hinton State Laboratory in Boston. She routinely certified samples as narcotics without even testing them; when tests came back negative, she added traces of illegal drugs to the samples. She even swore a cashew chunk was crack cocaine. After an investigation, Dookhan pleaded guilty to obstruction of justice, tampering with evidence and perjury in November 2013. The state dismissed more than 36,000 convictions based on her slipshod lab work. While one forensic scandal unfolded in Boston, another erupted across the state in Amherst, where police arrested analyst Sonja Farak after finding evidence that she had for nearly a decade been using drugs taken from lab supplies and evidence samples—methamphetamines to crack cocaine. She did lab work and testified while on drugs. State prosecutors failed to investigate fully and hid key evidence from attorneys representing defendants with convictions based on Farak's work. By early 2019, legal proceedings had exposed the Farak's years of misconduct, and dismissal notices finally went out in more than 10,000 cases.

These examples illustrate how crime lab errors and faulty forensics lead to false convictions, and they serve as cautionary tales about forensic science as currently practiced. Crime labs tend to favor the prosecution's side over the defendant's side, sometimes to the point of presenting misleading evidence. This institutional bias stands as an important obstacle to reducing the frequency of false convictions, and the criminal justice system isn't likely to overcome it without major reforms that shake up the status quo.

Entrepreneurs are a relentless source of disruption in the economy, and empowering them to provide independent forensic services to defendants would counterbalance the current conviction bias and inject a degree of fairness into the use of physical evidence in criminal proceedings. This Institute for an Entrepreneurial Society white paper presents a proposal that centers on vouchers—a money equivalent that would allow defendants to acquire the kind of forensic expertise available to the prosecution.

Forensic vouchers would give those accused of crimes a far better chance of countering the crime lab errors and biases that often lead to false convictions. A properly designed and effectively executed voucher-based reform would greatly reduce forensic science's conviction bias while increasing the criminal justice system's credibility and public perceptions of fairness. Largely sidelined in the current system, entrepreneurs could play a crucial role in improving forensic services by creating greater competition in in the field.

2 FORENSICS' SUBJECTIVITY

Josiah Sutton's exoneration highlights an aspect of forensic science that movies and television shows gloss over. Physical evidence—even with the most sophisticated forensic tools—doesn't always lead to the correct verdict, at least not the first time. The nonprofit Innocence Project at Yeshiva University's Benjamin N. Cardozo Law School has collected hundreds of similar stories, stating bluntly that faulty forensic science has been key to its work: "In over half of DNA exonerations, the misapplication of forensic disciplines—such as blood type testing, hair analysis, fingerprint analysis, bite mark analysis, and more—has played a role in convicting the innocent. In these cases, forensic scientists and prosecutors presented fraudulent, exaggerated, or otherwise tainted evidence to the judge or jury which led to the wrongful conviction." The travesty of forensic errors gains credence with exonerations based on the work of police departments' conviction integrity units and independent innocence projects in all parts of the United States.

Some mistakes arise from improper technique, carelessness or incompetence. A New Jersey state police sergeant certified that he had followed proper procedures for calibrating the Alcotest devices commonly used to collect evidence in drunk-driving arrests. It wasn't true. More than 13,000 convictions were called into question. In Massachusetts, concerns about the reliability of Alcotest results led to an ongoing review of 29,000 convictions. The headline on a New York Times article warned: "These Machines Can Put You in Jail. Don't Trust Them."

In general, the blunders of bad actors don't puncture the aura of infallibility that surrounds forensic science. The more troublesome errors emerge from the inherent

subjectivity of crime lab work. They lead to the mistakes that are the hardest to detect and the most difficult for defendants to challenge. This subjectivity is well-known among defense attorneys and often acknowledged by forensic scientists themselves. It has also been documented in a National Academy of Science report titled "Strengthening Forensic Science in the United States: A Path Forward" (2009).

Even when crime labs follow proper procedures, evidence doesn't reveal its secrets without a degree of explanation and interpretation. A critical judgment in most forensics, for example, involves establishing links between evidence collected at crime scenes and suspects or defendants. The science tells us that each person's fingerprints are unique, implying that they should provide foolproof means of identification. In the real world, however, latent prints collected at crime scenes are rarely clear and distinct, and matching smudged or partial prints with the neatly rolled prints taken at police headquarters may be as much intuition as science. Issues of interpretation extend across a range of physical evidence—shoeprints and tire tracks, tool marks firearms identification (commonly called "ballistics"), traditional hair microscopy, handwriting comparisons and bloodstain patterns. Time and again, forensic scientists must evaluate ambiguous evidence and give a binary judgment—in essence, guilty or not guilty—on whether the evidence does or does not match.

What about DNA evidence—isn't it an exception? The outcome of Sutton's initial trial suggests otherwise. After a review of the physical evidence, an FBI report on the Houston Crime Lab concluded: "The testimony strongly implied that this was a unique match, that Mr. Sutton was the only person in the world that would have this DNA pattern, when really thousands and thousands would." Like fingerprints, DNA samples aren't always in pristine condition. Judgements become more subjective when more than one person's DNA contributed to a sample, or when the sample is very small or has been contaminated or degraded. Some crime labs have turned to computer programs in an attempt to reduce some of the DNA analysis' subjectivity. These methods may appear to improve results, but the computers can't be cross-examined and concerns about validation and verification will remain. If software is proprietary, it raises issues of transparency—just how does the computer decide? In the end, computer matching might do little more than reinforce the misconceptions of forensic science's reliability.

Sometimes the science used to establish guilt turns out to be just plain wrong. In 1994, Elizabeth Ramirez, Kristie Mayhugh, Cassandra Rivera and Anna Vasquez, all four of them gay women living in San Antonio, were accused of sexually assaulting Ramirez's 7- and 9-year-old nieces. Witness testimony was inconsistent, but a key factor in their conviction was the testimony of a pediatrician who cited scientific studies in determining that marks on the child's genitals and anus couldn't have occurred due to natural causes. More than a decade later, the Innocence Project of Texas agreed to open an investigation. One of the nieces, now grown to adulthood, recanted and the same pediatrician who testified in the trials now told the court that the science had changed, and the marks were normal and not signs of abuse. After a two-decade ordeal, including 13 years in prison, the four women were exonerated in 2015.

When evidence is ambiguous, even the most scrupulous scientist must choose what to say or make judgments based on experience and intuition. Forensic evidence's inherent subjectivity provides an opening for the crime lab mistakes that influence the outcome of cases. The errors aren't random—a bias toward conviction is baked into the system. It arises from the way the United States finances and produces forensic services.

3 A GOVERNMENT ENTERPRISE

The U.S. criminal justice system serves a relatively straightforward but sometimes elusive end: determining the guilt or innocence of those accused of committing crimes against persons or property. The process should be both effective enough to convict the guilty and fair enough to spare the innocent. From investigation and arrest to trial and incarceration, the focus remains largely on individual defendants, yet the criminal justice system's greater purpose lies in society's interest in safeguarding us from violence and protecting our property rights. From this perspective, policing and punishing criminal acts should, like national defense, be regarded as collectively consumed public goods, better left to government rather than the private sector, lest society end up with too little or inequitable "defense" or "justice." The widely held belief that the administration of justice is a core responsibility of government justifies public funding of the criminal justice system, including the crime labs responsible for analyzing physical evidence.

The public goods perspective justifies governments paying for forensic services, but it doesn't require crime labs be operated by the public sector. Defense contractors sell to the Pentagon; companies earn profits building roads and operating schools. Forensic services could follow the same model—the public sector determining demand, the private sector providing the supply to meet it. If done correctly, going into the marketplace to buy forensic services could provide gains in efficiency, quality and equity. Simply put, there's no inherent reason why crime labs must be operated as public entities. Yet they nearly always are.

Forensic scientists dust for fingerprints, make casts of shoe prints and tire tracks, examine the markings on bullets and extract DNA from blood, saliva and other bodily fluids. In real life as in movies and television, the men and women who do this kind of work are usually government employees. According to the Justice Department's most recent crime lab survey, the combined operating budgets of the nation's 409 publicly funded crime labs was $1.7 billion in 2014. Their workload amounted to 3.6 million requests that year. The FBI and other federal agencies operate crime labs, but forensic evidence in the United States is largely the province of state and local governments. They provide 82 percent of the money spent annually on publicly funded crime labs. Financing is only part of forensic science's entanglement with the law enforcement. The state and local crime labs are often part of police departments, with regular interactions with district attorneys and the prosecutors. Private-sector entrepreneurs supply some forensic services, but the market has been stunted by the overwhelming presence of the publicly funded crime labs.

Government provision of forensic services creates an imbalance with disconcerting implications for the criminal justice system. Police and prosecutors have routine access to an abundance of resources—both financial and human—in establishing a scientific basis for their charges. On the other side, few defendants possess sufficient means to hire experts to collect and analyze evidence, thwarting efforts to develop alternatives to the case presented by prosecutors working with the government's crime labs. The forensic imbalance is particularly burdensome for indigent defendants.

Government forensics also raise issues of monopoly. One crime lab typically examines the crime scene and conducts any necessary forensics analysis. That very

same crime lab will usually be called upon for interpretation and expert testimony, often making judgments about subjective forensic evidence. This twofold monopoly of analysis and interpretation provides little room for independent scrutiny of the evidence and its significance for the question of guilt or innocence. Forensic errors, omissions and even fraud are less likely to be detected, and alternative scenarios more favorable to defendants are less likely to be considered. The government crime labs' science and explanations are more likely to go unchallenged, both before and after conviction.

Where blind justice would demand impartiality, the government system gives crime lab experts incentives to side with institutional interests that favor guilty pleas or verdicts. To a large extent, the bias arises from a synergy of purposes deeply rooted in the system. Police want to arrest the bad guys. Prosecutors want the bad guys found guilty and punished. Forensic scientists want to help the police and prosecutors succeed in convicting the bad guys. The experts, asked to explain the work of the same government crime lab that collected and processed the evidence, tend to produce results that support the criminal storylines laid out in plea bargains and trials. The government's imprimatur gives added credibility to forensic experts called by the prosecution and allowed by judges—so the crime labs' work carries great weight in legal proceedings.

This last point might shed some light on a provocative question: What might be the principle attraction of public provision of forensic services? Most likely, a large part of the answer lies in control—in effect, the monopoly itself. Police and prosecutors seek evidence and analysis more likely to support guilty-as-charged narratives; captive and cooperative crime labs are the best way to get it. The powers-that-be in law enforcement cite what they see as the advantages of public crime labs, and politician leaders and public and respond by funding them. The incentives favoring conviction may encourage a few forensic scientists to falsify data, but openly cheating or consciously isn't necessary to create bias toward convictions. Incentives matter even for those sincerely motivated to pursue justice. Looked at this way, the twofold monopoly, with its misaligned incentives, represents a feature not a bug, with strong support inside the criminal justice system. The widespread acceptance of the status quo presents an obstacle to reforms aimed at forensic fairness.

The twofold monopoly and misaligned incentives make it difficult to determine how often forensic work contains errors and, more important, how often these errors lead to false convictions. Miscarriages of justice do regularly come to light, usually when the legal system acknowledges its own errors by exonerating prisoners and setting them free. However, not all false convictions get reversed. Innocent prisoners remain locked behind bars or, if free after ending their sentences, unfairly bear the social stigma of criminality. In a system where incentives favor conviction and forensic evidence usually goes unchallenged, it's likely that only a small share of crime-lab errors will be uncovered and result in exonerations.

Although the number of false convictions can't be known with any precision, Seton Hall University law professor Michael Risinger made an estimate for rape and murder cases, using the advent of DNA evidence in the early 1990s to help identify improper verdicts. His 2007 study, titled "Innocents Convicted: An Empirically Justified Factual Wrongful Conviction Rate," found a minimum factual rate of 3.3 percent for improper verdicts among rape and murder cases from the 1980s. Recognizing the inherent difficulties of identifying wrongful verdicts, Risinger suggested the true rate might be as high as 5 percent. The frequency of false convictions will vary by category of crime and time period, but Risinger's estimates suggest a range of 30,000 to 60,000 false convictions a year among the nation's more than 1 million felony cases. Half of them might involve forensic errors—if the experience of Yeshiva University's Innocence Project holds in general. In the face of such uncertainty, society cannot just assume that forensic errors and the resulting false convictions aren't problems big enough to warrant corrective action.

4 WORSENING THE CONVICTION BIAS

State and local funding of crime labs is central to the forensic imbalance that underlies the bias toward conviction. A patchwork of laws and court practices govern the financing and organization forensic funding, with varied consequences for the incentives to favor police and prosecutors over defendants. Funding crime labs through general revenues, for example, probably doesn't intensify the potential bias against defendants. Additional incentives for conviction do, however, arise from another source of government funding. About half of all states support crime labs—at least in part—through fees paid by defendants and earmarked for forensic services. The idea is relatively straightforward: Rather than have taxpayers fund crime labs, these jurisdictions put the burden on those who are using forensic services, most likely involuntarily. The charges are fixed amounts in some places, percentages of court fees or restitution for forensic services in others

North Carolina's general statutes require, "[f]or the services of" the state or local crime lab, that judges in criminal cases assess a $600 fee to be charged "upon conviction" and remitted to the law enforcement agency containing the lab whenever that lab "performed DNA analysis of the crime, tests of bodily fluids of the defendant for the presence of alcohol or controlled substances, or analysis of any controlled substance possessed by the defendant or the defendant's agent." Kansas compels offenders "to pay a separate court cost of $400 for every individual offense if forensic science or laboratory services or forensic computer examination services are provided in connection with the investigation." Washington requires a $100 crime lab fee for any conviction that involves lab analysis. Illinois crime labs receive fees upon convictions for sex offenses, controlled

substance offenses, and those involving driving under the influence. Mississippi statues require crime laboratory fees for various conviction types, including arson, aiding suicide and driving while intoxicated. Other states also require crime-lab fees in connection with various types of convictions include Alabama, Arizona, California, Kentucky Missouri, New Jersey, New Mexico, Tennessee, Virginia, and Pennsylvania.

The incentives to build cases against defendants are clear because fees are explicitly tied to convictions—exonerated defendants don't pay. No conviction, no money. Even when small, the fees allow a subtle, or perhaps not so subtle, bias to creep in. The more convictions and guilty pleas crime labs help produce, the larger their operating budgets. The obvious strategy to help maximize a crime lab's financial resources centers on giving police and prosecutors physical evidence that helps deliver guilty verdicts.

How important are the court fees? Data are spotty, but fees made a significant contribution to budgets for forensic services in at least a handful of places—notably, Iowa at 84 percent, Louisiana at 72 percent, Arizona at 42 percent, and Kansas at 17 percent, with Alabama and Mississippi just about 11 percent. The funds are no doubt important to keeping many crime labs functioning—even if defendants who are convicted or plead guilty pay only relatively modest fees. In a 2004 Journal of Biolaw and Business article, Ray Wickenheiser analyzed operations at the crime lab in one Louisiana parish and concluded: "Collection of court costs is the only stable source of funding for the Acadiana Crime Lab. $10 is received for each guilty plea or verdict from each speeding ticket, and $50 from each DWI (Driving While Impaired) and drug offense."

Eliminating court fees would help balance incentives, but it wouldn't go nearly far enough. In many cases, the alternative probably would be funding crime labs through some other means, such as additional appropriations. The forensic monopoly would remain in force—with its bias toward convictions.

Asking taxpayers to dig deeper into their pockets to ease the burdens on suspected criminals, drunken drivers and drug suspects would no doubt be a hard sell in many jurisdictions. So the court fees that fund crime labs are likely to stay or even increase. Is the U.S. criminal justice system condemned to muddle forward with the present misaligned incentives and false convictions? The answer would surely be yes—unless the country enacts reforms that move toward greater forensic fairness. Achieving that goal would entail making the criminal justice system itself less susceptible to errors in collection, analysis and interpretation. The effort starts with breaking a chain that starts with the imbalance created by public funding of crime labs. Government financing doesn't in and of itself create incentives toward conviction; the bias only emerges when taxpayer dollars meet the near monopoly on crime labs. Giving defendants greater access to forensic services would go a long way toward disrupting the twofold monopoly and reducing the incentives that create a bias toward convictions. In improving the handling of physical evidence, reformers can't forget that the criminal justice system is a public good, which imposes an obligation to address issues of credibility and perceptions of fairness.

5 OPPORTUNITIES FOR ENTREPRENEURS

In confronting the tragedy of false convictions, administrative responses from within the system would likely focus on how the government crime labs conduct their business. A fix for forensic errors, however, isn't strictly a bureaucratic or science problem, solvable by added training, stricter standards, improved procedures and more rigorous inspections. While potentially useful, these actions fail to dig out the roots of forensic errors and the bias toward convictions. The proposed voucher system, on the other hand, would simultaneously maintain government funding of a public good, recognize the forensic science's inherent subjectivity, redress the funding imbalances and sunder the twofold monopoly. It would also create opportunities for entrepreneurs.

In the field of education, vouchers are widely accepted as a way to tap into the innovation and efficiency of entrepreneurship while serving the public's interest in expanding educational opportunities for students from poor and middle-class families. For each child, households receive an educational voucher equal to the cost of a year of schooling, giving parents and students the means to pay for tuition at the school of their choice. By allowing families to decide what's best for their children, vouchers introduce an element of market competition into what had in most places been a public-school monopoly. Today, school-choice movements are active in nearly every state, and educational entrepreneurs have started schools in communities across the country.

A similar scheme could address the forensic imbalance and break up the twofold monopoly that gives crime labs the incentive to support police and prosecutors. Defendants in criminal cases would receive vouchers good for purchasing forensic services. We'll consider the dollar value after exploring the idea. By themselves, the vouchers won't give defendants equal access to forensic services. The accused, aided by their lawyers, must also be given control over how to use the money. It seems likely that the defendants would choose forensic experts not aligned with police and prosecutors. These professionals would not just be independent, they would have an incentive to serve the defendants' interests. At a minimum, they would make sure the government labs followed proper procedures and testified accurately about subjective interpretations of evidence. In addition, they might conduct additional tests and counter the prosecution's accusations with information more favorable to defendants. It's not hard to envision how this kind of expertise might have helped avoid the travesty of Josiah Sutton's conviction or the 50,000 dismissals in Dookhan and Farak fiascos.

Where the existing system results in a twofold monopoly, forensic vouchers would introduce competition, a traditional remedy for monopoly. The virtues of competition aren't alien to the criminal justice system. What is cross-examining witnesses if not a competition between two opposing sides, with the expectation that truth will come out as witnesses answer questions? Publicly funded crime labs are normally part of the prosecution's team and the defendant's lawyers can question the forensics scientists and call upon expert testimony to refute physical evidence. The contest, however, is hardly an equal one. Most defendants—in

particular, the indigent ones—don't have the resources to collect exculpatory evidence that refutes the prosecutors' narratives. The vouchers would put defendants on a level playing field with police and prosecutors. Forensic scientists in government-funded crime labs might still tilt in favor convictions for the reasons they always have, but the countervailing weight of voucher-funded expertise would create more evenly matched and adversarial contests.

The voucher idea would assign a central role to non-government suppliers of forensic services. That's where entrepreneurs step up. In effect, defendants with vouchers would be customers, looking buy forensic services. Seeing opportunities for profit, entrepreneurs would channel resources into meeting the expanding demand, opening new labs, hiring forensic scientist to staff them and offering forensic services that meet the justice system's standards. The new labs would need equipment and supplies; other entrepreneurs would step forward to meet this secondary demand. Markets work this way for most goods and services, and there's no reason why they shouldn't for forensic science. Aided by their lawyers, defendants facing the grim prospect of prison have powerful incentives to seek out the private labs provide the highest quality forensic services. Private labs that don't deliver would go out of business—something that would never happen in the public domain.

Attracting and maintaining customers requires an edge—for example, lower prices, better quality, superior service, faster delivery or specialized knowledge. Forensic entrepreneurs would face strong incentives to innovate. They would seek market advantages—and higher profits—through research and development that leads to new products or new ways of delivering existing products. Throughout the economy, entrepreneurs responding to market incentives are generally the wellspring of lower prices and improved quality. By contrast, government crime labs in the public sector don't need to compete; they have little incentive to innovate and improve. Nothing in the field of economics suggests that the near monopoly of public crime labs will systematically offer services that are cheaper and better.

Introducing vouchers on a wide scale is likely to change the way the country produces forensic services. The government would remain a big player, but its dominance would subside with the arrival of entrepreneurs and competition. Rather than handling all types of evidence, crime labs may capture the well-known gains from specialization, perhaps some concentrating on DNA and others on fingerprints or ballistics. If the private sector were to offer lower prices and improved quality, some jurisdictions might decide to close expensive crime labs and buy what they need from the private crime labs, even ones located in other states. The private-sector alternative might particularly attractive to smaller states and jurisdictions, where public crime labs are less likely to be fully utilized.

The voucher idea engages the private sector and generates competition, but it falls short of outright privatization. Governments would still fund forensic services as a public good, the crime labs affiliated with law enforcement as well as the independent scientists hired by defendants. As with other markets, it will be important for authorities to ensure competition doesn't fall prey to industry collusion. Private monopolies don't work any better than public ones. Judges and other public officials would maintain control over the use of physical evidence and expert testimony.

6 WHAT VOUCHERS' MIGHT COST

The proposed vouchers would favor defendants and require public financing. Neither prospect seems likely to appeal to those alarmed by crime or unsympathetic to defendants. Two points should quickly settle the contentious matter of helping those accused of crimes. First, defendants aren't criminals until proven guilty, and those falsely convicted are innocent victims of injustice. Second, defendants' rights—those guaranteed in the Constitution as well as those added later—serve as bulwarks of liberty that protect all members of society. Forensic vouchers might someday save you or a member of your family from a false conviction.

On to the practical matter of how much a forensic voucher system might add to the $270 billion a year the country already spends on the criminal justice system. It's important to acknowledge at the outset that any cost estimate will be imprecise. Funding will depend on the voucher scheme's specific features, and they will remain murky until governments begin to debate the idea. Future caseloads will be uncertain. It's difficult to anticipate the financial implications that vouchers bring to the criminal justice system, but even an overly cautious estimate suggests that the country can get a big increase in justice for a relatively small increase in spending.

Establishing a factual basis for a cost calculation on vouchers starts with data from the Department of Justice's crime lab survey. The average cost of the 3.6 million forensic requests handled in 2014 was $472. If a typical case required two or three requests, and assuming private-sector labs' finances would be about the same as public ones, the total would be $944 to $1,416. According to the Bureau of Labor Statistics, a forensic

technician earns about $60,000 a year, or $1,200 a week. If the typical expert could handle one case a week and took two weeks' vacation, the average cost per case would be $1,200. Putting it together, a reasonable estimate for the vouchers' worth would be $2,000 per defendant. Assuming the vouchers would be available to defendants in all 1.9 million felony cases in a typical year, the total cost would be around $3.8 billion. The estimate is most likely on the high side. First, forensics aren't involved in all felony cases. Second, the figure ignores the voucher system's probable impacts on lowering costs through competition, specialization and innovation.

It's important to put the $3.8 billion in perspective. The United States spends $270 billion a year on its criminal justice system, so forensic vouchers would increase overall costs by about 1.4 percent. And if the federal government funded the program, the vouchers would add only about 0.09 percent to the $4.4 trillion federal budget.

The accounting thus far hasn't considered the money spent on keeping the wrongfully convicted in prison. In the United States, annual incarceration costs are about $31,000 per prisoner. The prison time for felony convictions averages about five years, or a total of $155,000. The vouchers cost depends on cases rather than convictions—so the number is too high. Department of Justice statistics indicate that only 59 percent of felony cases lead to convictions or guilty pleas, reducing the incarceration cost per felony case to $91,450. At some point, the savings from not incarcerating the wrongly convicted would offset the extra cost per case of forensic vouchers. Based on the calculations just presented, a voucher scheme would reduce the criminal justice system's overall costs if forensic evidence failed to sustain the charges in only 2.2 percent of felony cases, leading to dismissals rather than convictions.

Hitting the magic number isn't certain, but it's within the realm of possibility. Risinger estimated that false convictions occur in 3.3 percent of cases at a minimum—but, he suggested, the rate might be as high as 5 percent. Yeshiva University's Innocence Project found that half its exonerations involved forensic errors, so the vouchers might eliminate 1.65 percent to 2.5 percent of false convictions. If rates of false convictions are higher than the 2.2 percent estimate, the vouchers would deliver an overall savings for society. Even below 2.2 percent, the total cost would most likely fall well below the $3.8 billion estimate. When weighed against the money wasted keeping the wrongly convicted behind bars, the overall cost of forensic vouchers wouldn't be prohibitive.

However the financing works out, society would gain something more important. Forensic science done properly serves the cause of justice; when errors occur without correction, it undermines the cause of justice. Vouchers would eliminate or at least greatly reduce the forensic imbalance, giving the defense the same firepower as the prosecution. It would break up the twofold monopoly, introducing adversarial voices and independent analysis. Forensic evidence, with its inherent subjectivity, would be less likely to go unchallenged, increasing the chances of exposing errors or spurious crime scenarios. The forensic vouchers would help reduce the frequency of false convictions—a worthy end it itself. Indigent defendants face the biggest obstacles to accessing forensic services, and vouchers would be an important step toward fulfilling the promise of more egalitarian justice. More broadly, the rule of law rests on foundation of fairness, and forensic vouchers would help counter perceptions that police and courts are stacked against defendants and bolster public confidence in the criminal justice system.

7 NOTES AND SOURCES

Page 4: Information on the Josiah Sutton case comes from a series of articles in The Houston Chronicle, beginning on November 16, 2002. Available at www.chron.com. The case is summarized on the National Registry of Exonerations. Available at https://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3672.

Page 5: Information on Annie Dookhan comes from Shawn Musgrave, "The Chemists and the Cover-Up," Reason magazine, March 2019. Available at www.reason.com.

Page 5: Information on Sonja Farak comes from Shawn Musgrave, "The Chemists and the Cover-Up," Reason magazine, March 2019. Available at reason.com.

Page 6: "In over half of DNA ..." The Innocence Project, Facts on Post-Conviction DNA Exonerations. Available at www.innocenseproject.org/content/351.php.

Page 6: Information on the New Jersey and Massachusetts misuse of Alcotest machines comes from Nick Corasanti and Sharon Otterman, "20,667 Drunken-Driving Convictions Tainted by Bad Breathalyzer Test in New Jersey," New York Times, November 13, 2018 and Stacy Cowley and Jessica Silver-Greenberg, "These Machines Can Put You in Jail. Don't Trust Them," New York Times, November 3, 2019.

Page 7: Ideas about forensic subjectivity came from William C. Thompson, "Painting the Target Around the Matching Profile: The Texas Sharpshooter Fallacy in Forensic DNA Interpretation," Law, Probability and Risk 8 (2009): 257-76; William C. Thompson and Simon A. Cole. "Psychological Aspects of Forensic Identification Evidence," in Expert Psychological Testimony for the Courts, ed. M. Costanzo, D. Krauss, and K. Pezde (Mahwah: Erlbaum, 2007), 31-68; Michael Risinger et al., "The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestions," California Law Review 90 (2002), 1-56.

Page 7: "The testimony strongly ..." Roma Khanna, "DNA from Conviction of Teen will be Retested: 1999 Rape Case Part of HPD Crime Lab Review," The Houston Chronicle, February 8, 2003. Available at www.chron.com.

Page 7: Information on DNA comes from Roger Koppl and Meghan Sacks "The Criminal Justice System Creates Incentives for False Convictions," Criminal Justice Ethics (2013), 32:2, 126-162. Available at http://dx.doi.org/10.1080/0731129X.2013.817070.

Page 7: Computer programs and DNA: Nathaniel Adams, Roger Koppl, Dan Krane, William Thompson, J.D. and Sandy Zabell, "Appropriate Standards for Verification and Validation of Probabilistic Genotyping Systems," Journal of Forensic Sciences (2018) 63(1): 339-340.

Page 7: The cases of Elizabeth Ramirez, Kristie Mayhugh, Cassandra Rivera and Anna Vasquez are summarized on the National Registry of Exonerations. Available at https://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=5048.

Page 8: Data on U.S. crime labs comes from Mathew R. Durose, Andrea M. Burch, Kelly Walsh and Emily Tiry, "Publicly Funded Forensic Crime Laboratories: Resources and Services, 2014," U.S. Department of Justice, November 2016. Available at https://www.bjs.gov/content/pub/pdf/pffclrs14.pdf.

Page 9: Rate of false convictions come from Michael Risinger, "Innocents Convicted: An Empirically Justified Factual Wrongful Conviction Rate," Journal of Criminal Law and Criminology 97 (2007): 761! 806.

Page 10: North Carolina General Statutes, Chapter 7a, § 8a-304.

Page 10: Kansas Statutes Annotated, Chapter 28, § 28-176.

Page 10: Revised Code of Washington, Title 43, § 43.43.690.

Page 10: Mississippi Code Annotated, §§§ 97-3-49, 97-17-13, 879-3-49.

Page 11: "Fees made a significant contribution to budgets for forensic services ... " Author's calculations based on state budget data.

Page 11: Acadiana Parish discussed in Ray Wickenheiser, "The Business Case for Using Forensic DNA Technology to Solve and Prevent Crime," Journal of Biolaw and Business 7 (2004): 3.

Page 14: "The 3.6 million forensic requests ..." Durose, et al., "Publicly Funded Forensic Crime Laboratories: Resources and Services, 2014."

Page 15: "A forensic technician earns about $60,000 a year" ... https://www.bls.gov/ooh/life-physical-and-social-science/forensic-science-technicians.htm.

Page 15: "The total cost would be around $3.8 billion ..." The Bureau of Justice Statistics put the conviction rate at 59 percent: "Among felony defendants whose cases were adjudicated within the one-year tracking period (89% of cases), 68% were convicted. This includes a 59% felony conviction rate with the remainder receiving misdemeanor convictions." Available at https://www.bjs.gov/index.cfm?ty=qa&iid=403. Felony convictions total 1.1 million a year. A conviction rate of 59 percent implies 1.86 million felony cases—rounded up to 1.9 million. Multiplying by $2,000 yields $3.8 billion.

Page 15: "The United States spends $270 billion a year ..." (https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160423_cea_incarceration_criminal_justice.pdf).

Page 15: "The $4.4 trillion federal budget ..." https://www.usaspending.gov/#/.

Page 15: "Annual incarceration costs per prisoner are about $31,000" ... https://www.marketplace.org/2017/05/19/how-much-does-it-cost-send-someone-prison/.

Page 15: "Reducing the incarceration cost per felony case to $91,450 ..." The Bureau of Justice Statistics put the conviction rate at 59 percent. https://www.bjs.gov/index.cfm?ty=qa&iid=403. If 59 percent of cases result in the average five-year sentence, that's 2.95 years per case. Multiplying $31,000 by 2.95 yields $91,450.

Page 15: "Risinger estimated that false convictions ..." Risinger, "Innocents Convicted: An Empirically Justified Factual Wrongful Conviction Rate.'

INSTITUTE FOR AN ENTREPRENEURIAL SOCIETY

Vision

IES envisions an entrepreneurial society in which the market process generates innovation, opportunities and economic growth, as well as a society in which entrepreneurial innovation is supported by institutions that unleash human creativity and productivity.

Mission

The Institute for an Entrepreneurial Society's mission is to produce high-quality evidence-based research on the political economy of entrepreneurship, educate future thought leaders in the field, and engage the academic community in explorations of the entrepreneurial society. IES scholars examine the institutions that foster societal well-being and promote productive entrepreneurship.

Maria Minniti, Director
Louis A. Bantle Chair in Entrepreneurship and Public Policy

Roger Koppl, Associate Director
Professor of Finance

ies@syr.edu

Syracuse University
Whitman School
of Management